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Title: Concrete Block for Retaining Wall Construction and Retaining Wall

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Specification

The invention concerns a concrete block for construction of retaining walls with one-sided backfill (soil side) using courses of tiered blocks, each featuring a front, a back facing the soil, opposing long sides, top side and bottom side, the top side and bottom side forming adjacent support surfaces. The invention also concerns a retaining wall constructed of such blocks.

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Blocks of the type addressed here are known from EP-B-0 191 908. They are suited for the construction of retaining walls of large height and with one-sided soil backfill. For a nonexpert (layman) performing the construction work it is difficult to judge at what point the maximum height of the retaining wall is reached, at which the wall still possesses stability. A further disadvantage is that the prior block is considerably heavy. Lastly, it is not possible with the prior blocks to construct one-sidedly backfilled retaining walls which extend horizontally at selective curve shapes and with no clearances in the exposed front, since said blocks are cuboid in shape.

The object underlying the invention is to create a block which is easy to lay by the layman and a retaining wall of several [sic] such blocks with a mandatorily limited maximum height.

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The block satisfying this objective is characterized in that at least one effective support surface of the top side and/or bottom side of the block is inclined with respect to an imaginary horizontal plane.

The advantages achieved with the invention are constituted specifically in that the retaining wall built with the blocks is being limited automatically in its height. According to the invention, this is accomplished in that the retaining wall has with respect to a vertical plane an inclination which increases with each additional course of tiered blocks. Construction of the retaining wall starts with a bottom course of blocks on a level, horizontal concrete footer. Increasing with the height of the retaining wall, its inclination limits in obvious manner, notably for a laymen, the height of the retaining wall. In a further embodiment of the invention, the flatness of the support surfaces makes the blocks easy to handle in forming the retaining wall. The back of the block is clearly distinguished by the gradually decreasing spacing between top side and bottom side toward the back. Also, the construction of a retaining wall using the invention block is thereby made easy for the layman.

A further favorable effect derives from the corresponding projections and a recess in the blocks. The projections of a block mesh easily with the recess in a further block. Created thereby is a locking which prevents the blocks from shifting, at least in longitudinal direction.

The projections of the blocks are favorably configured as individual projections, notably as two mutually spaced individual projections, and the recess as a rectilinear continuous groove transverse to the block. This design makes it possible to arrange the courses of blocks laterally offset relative to one another, imparting increased stability to the retaining wall. Moreover, the designer latitude regarding the construction of the retaining wall in keeping with aesthetic aspects is being enhanced.

A further feature of the invention, namely two long sides of the block converging toward the back, allows the creation of arcs, curves, rounded corners etc. of the retaining wall. The laying of the blocks is not restricted. The creation composed of retaining wall and soil backfill may be configured, according to the invention, convex or concave in lateral direction. The variability in the curve shape of the retaining wall achieved thereby enhances the designer options for the construction of the wall. Moreover, the weight of the blocks is reduced in that the long sides converge toward the back.

According to the invention, the front is configured such that it features a flat center section and two lateral rounded end sections, preferably arcuate in shape. These are created in a single step of the manufacturing process, by knocking off so-called gores. Owing to the flatness of the front center section, waste accrues in the manufacture only from the side sections. The reduction of waste associated with it allows a more economical production of the invention block. Furthermore, the configuration of the front is conducive to shape-aesthetic effects of the block and of the wall constructed thereof.

An exemplary embodiment of the invention is illustrated in the drawing and more fully described hereafter. The drawing shows in:

- 20 Fig. 1, a plan view of a block;
- Fig. 2, a side elevation of the block;
- Fig. 3, a front view of the block;
- Fig. 4, a rear view of the block;
- Fig. 5, a cross section of a retaining wall with one-sided soil backfill, using inventional
25 blocks;
- Fig. 6, a plan view of a course of blocks forming a curve;

Fig. 7, a plan view of a course of blocks making a directional change;

Fig. 8, a plan view of two tiered courses of blocks producing a retaining wall with a front vaulting inward;

Fig. 9, a plan view of two tiered courses of blocks producing a retaining wall with a front vaulting outward;

5 Fig. 10, a side elevation of blocks stacked on a Euro-pallet; and

Fig. 11, a plan view of a double block in the manufacture.

10 As illustrated in Fig. 1–4, the block 20 features a front 21, a back 22 (soil side) facing the soil, two opposing long sides 23 as well as a top side 24 and a bottom side 25. Top side and bottom side 24, 25 are flat and serve as support surfaces in the construction of a retaining wall.

15 The block 20 has two flat long sides 23 converging from the front 21 to the back 22, said long sides extending symmetrically with respect to a vertical longitudinal plane 26. Thus, the block 20 is given a trapezoidal appearance in plan view.

20 Arranged on the top side 24 are two projections, namely two knobs 27, which with respect to the longitudinal center plane 26 are arranged symmetrical with the length sides 23 near the edges. Said knobs have truncated-cone shape. Alternatively, the knobs 27 may also be configured as a truncated pyramid, cylindrically or in other ways.

25 The opposing bottom side 25 contains a recess, fashioned here as a continuous groove 28 and extending rectilinearly between the long sides 23. The groove 28 is shaped such, namely trapezoidal in cross section, that it may be engaged by the knobs 27 of a second block 20.

The front 21 of the block 20 possesses a flat center section 29. Bordering on both sides of the center section 29, outwardly, is an arcuate end section 30 each.

Toward the back, the blocks 20 are provided with roundings 31 joining the long sides 23 to the back 22.

The block 20 is configured such that the top side 24 is inclined relative to the bottom side 25, and at that, sloping toward the back 22.

10 Tiered in courses and with the top sides and bottom sides 24, 25 serving as support surfaces, the blocks 20 produce a tilting retaining wall 32 suited, according to Fig. 5, to join a top plane to a bottom plane and, as the case may be, provide support. To that end, the blocks 20 are laid as follows:

15 The bottom course of blocks 20 rests on a flat substrate forming a horizontal support surface 33, notably a (concrete) footer 34. Owing to the inclined top sides 24 of the blocks 20, the retaining wall 32 assumes with each further course of blocks 20 a greater tilt toward the back 22 of the blocks 20. In this exemplary embodiment, the backs 22 are backfilled with soil, whereas the fronts 21 remain exposed. Resulting from the inclination of the retaining wall 32, which increases with growing height, is a "natural" limitation in height, which notably for a layman provides a clue as to reaching maximum height.

20 Displacement along the longitudinal center plane 26 is prevented by the meshing of the corresponding knobs 27 and grooves 28 of the various courses of blocks 20.

Converging toward the back of the blocks 20, the long sides 23 make the retaining wall 32 suited for a curving course in long sides direction. In Fig. 6, four adjacent blocks 20 allow the formation of a bend with a center angle of approximately 90°. The radius of the arc is here about 65 millimeters, is thus relatively small. The long sides 23 of the adjacent blocks 20 are nearly in contact, with no openings or gaps in the front of the retaining wall 32 formed by the front faces 21 of adjacent blocks 20. Fig. 7 illustrates a one-sidedly soil-backfilled retaining wall 32 following both a concave and a convex course. Formed by two long sides 23 of adjacent blocks 20 intersecting in the area of the front 21, the opening angle changes depending on the decree of vaulting. The maximum opening angle amounts to about 45°. Formed by the fronts 21, the front of the retaining wall 32 shows no space or gap, despite its vaulting in different directions.

Due to the configuration of the complementing knobs 27 and the groove 28 it is also possible to arrange the courses of blocks 20 at a relative offset. For that purpose, the blocks 20 are tiered such that the groove 28 of the top block meshes with one each knob 27 of two bottom blocks 20. Fig. 8 and Fig. 9 illustrate both the convex and concave design of the retaining wall 32 with offset courses of blocks 20. This evidences that the blocks 20 can be laid at an offset also in an arcuate retaining wall 32.

Employed in the manufacture of the described blocks 20 is a frame placed on a (top) board-like substrate (form board). The frame is configured such that it allows molding a double block 35. The two resulting blocks 20 border on each other with their fronts 21, according to Fig. 11. Provided with two skew compression surfaces and introduced in the frame, or form pockets thus formed, a plunger generates the inclined design of the top sides 24 of the blocks 20. Truncated-cone-shaped recesses in the plunger result in the molding of the knobs 27 on the top side 24 of the block 20. Furthermore, the plunger

creates a V-shaped notch in the area of the edge between front and top side 21, 24, resulting in a bevel 36 declining toward the front 21.

5 To obtain two individual blocks 20 from the double block 35, so-called gores 37 need to be knocked off sideways, which accrue as waste. Hence, the fronts 21 are after separation of the blocks 20 configured such that their center extension is flat while the side edges are arcuate. The recess in the bottom side 25 of each block 20 is molded using a drawing rail on a drawing plate. In molding the blocks 20, the drawing plate rests on the form board, i.e., between frame and form board. Upon removal of the drawing plate with the joined drawing rail and of the frame arranged loosely on the double block 10 35, several simultaneously formed double blocks 35 can usually be cured while sitting on the form board.

15 Following the manufacture of the individual blocks 20, they are stacked on so-called Euro-pallets 38. Fig. 10 gives an impression of the stack of blocks 20 arranged slightly spaced from one another. Their tiering is such the bottom side 25 of the top block 20 rests on the top side 24 of the bottom block, with complementing grooves 28 and knobs 27 meshing. To compensate for the inclinations caused by the top sides 24, a wooden strip 39, about 2 centimeters thick, is placed crosswise between top side and bottom side 20 24, 25 of the blocks 20.

25 With reference to the favorable embodiment of the block 20 in Fig. 1 and Fig. 2, its length amounts to 30 centimeters. Formed jointly by the knobs 27 and groove 28, the vertical plane 40 is spaced from the front 21 about 10 centimeters. The converging long sides 23 cause the width of the block 20, of about 25 centimeters on the front 21, to

decrease linearly toward the back 22 of 12 centimeters, each long side 23 forming with a vertical plane an acute angle of about 23°.

The grooves 28 are spaced 17.5 centimeters from one another. The height of the block 20, amounting to 15 centimeters at the front 21, decreases toward the back 22, thus assuming in this exemplary embodiment a value of 13 centimeters on the back 22. This equals an inclination of the top side 24 in relation to the bottom side 25 with an angle of inclination of about 4°. In this favorable embodiment, the groove 28 narrows from 4 centimeters on the bottom side 25 to 1.7 centimeters, its depth amounting to 2 centimeters. Resting with a diameter of 3.2 centimeters on the top side 24, the knobs 27 obtain a height of 1.5 centimeters, the diameter reducing as well to 1.5 centimeters. As a result, the blocks 20 used to construct the retaining wall 32 butt with their flat support surfaces, formed by the top sides 24 and bottom sides 25, parallel. The dimensions chosen for the groove 28 and the knobs 27 guarantee a nonsqueezing laying of the blocks 20 in constructing a curve.

List of References

20	Block	31	Rounding
21	Front	32	Retaining wall
20	Back	33	Substrate surface
22	Long side	34	Concrete footer
23	Top side	35	Double block
24	Bottom side	36	Bevel
25	Longitudinal centerline	37	Gore
26	Knob	38	Euro-pallet
27	Groove	39	Wooden strip
28	Flat center section	40	Vertical plane
29	Arcuate end section		
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Claims

1. Concrete block for construction of retaining walls with one-sided backfill (soil side) using courses of tiered blocks, each featuring a front, a back facing the soil, opposing long sides, top side and bottom side, the top side and bottom side forming adjacent support surfaces, **characterized in that** at least one effective support surface of the top side and/or bottom side (24, 25) is tilted with respect to an imaginary horizontal plane.
- 10 2. Block according to claim 1, **characterized in that** the support surfaces of the block (20) are configured with a spacing between top side and bottom side (24, 25) which decreases toward the back (22) of the block (20).
- 15 3. Block according to claim 1 or 2, **characterized in that** the top side (24) of the block (20) forms a flat support surface sloping toward the back (22).
4. Block according to claim 1 as well as one or several of the further claims, **characterized in that** the top side (24) of the block (20) has an inclination of about 7 %.
- 20 5. Block, specifically according to claim 1, **characterized in that** the blocks (20) of the retaining wall (32) feature on their top side and bottom side (24, 25) mutually corresponding and mating projections (knobs 27) and recesses (grooves 28).
- 25 6. Block according to claim 5, **characterized in that** the projections are configured as knobs (27), specifically as two mutually spaced knobs (27), and the recess as a rectilinear groove (28).

7. Block according to claim 5 or 6, **characterized in that** the projections on the top side (24) are configured as truncated-cone-like knobs (27), and in that the recess in the bottom side (25) of the block (20) is configured as cross-sectionally trapezoidal groove (28), said groove extending rectilinearly from one long side (23) to the other long side (23).

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8. Block according to claim 5 and one or several of the further claims, **characterized in that** the groove (28) and the knobs (27) are disposed in a common (vertical) plane (40).

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9. Block according to claim 5 and one or several of the further claims, **characterized in that** the knobs (27) are arranged on the top side (24) of the block (20), spaced slightly from the long sides (23).

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10. Block according to claim 5 and one or several of the further claims, **characterized in that** the knobs (27) are less high than the groove (28) is deep

11. Block, specifically according to claim 1, **characterized in that** the block (20) is configured with long sides (23) converging toward the back (22).

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12. Block according to claim 11, **characterized in that** the long side (23) forms with a vertical plane an acute angle of about 23°.

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13. Block, specifically according to claim 1 and one or several of the further claims, **characterized in that** the front (21) of the block (20) is formed in the center area by a flat center section (29) and in the bordering side areas by arcuate (rounded) end sections (30).

14. Block according to claim 1 and one or several of the further claims, **characterized in that the block (20) features in the area between the front (21) and the top side (24) a bevel (36) sloping toward the front (21).**

5 15. Retaining wall with one-sided soil backfill, composed of tiered blocks designed according to one or several of the claims 1 through 12, **characterized in that all of the blocks (20) of the retaining wall (32) are laid, with the support surfaces sloping toward the soil side, such that the retaining wall (32) has in vertical section an arcuate or polygonal profile.**

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16. Retaining wall according to claim 15, **characterized in that the bottom course of the blocks (20) rests on a concrete foundation (34) with a horizontal support surface (33).**

15 17. Retaining wall, specifically according to claim 15 or 16, **characterized in that the blocks (20) of the retaining wall (32) are tiered at an offset, such that one each projection (knob 27) of two adjacent blocks (20) engages the recess (groove 28) of the block (20) of an adjacent, specifically top course.**

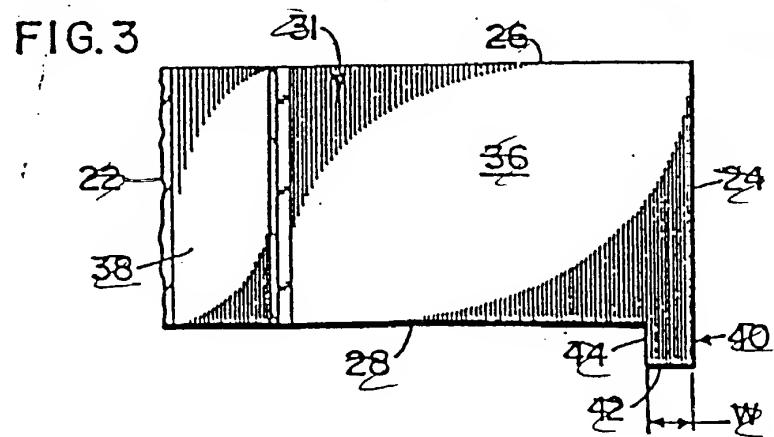
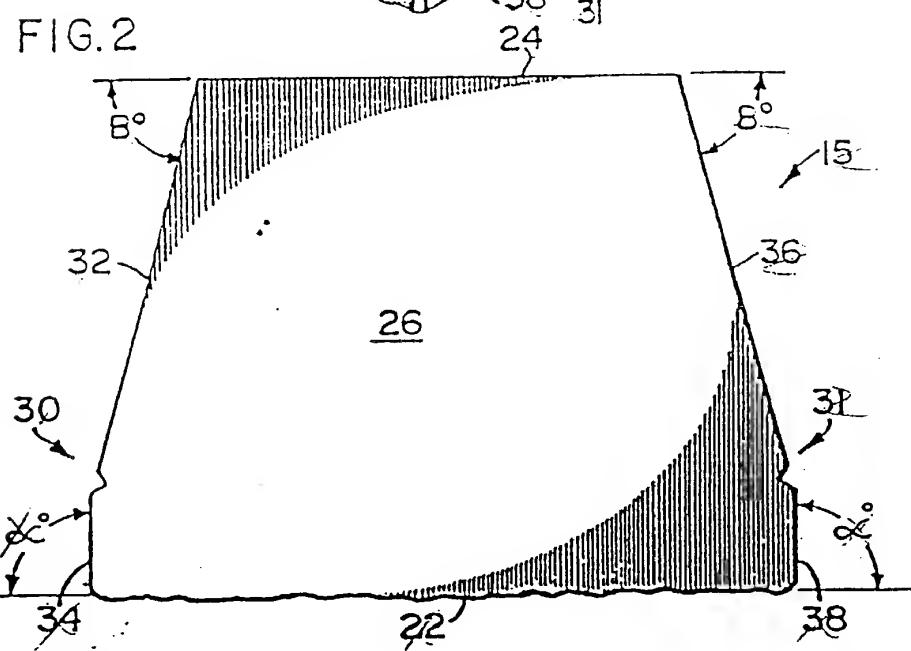
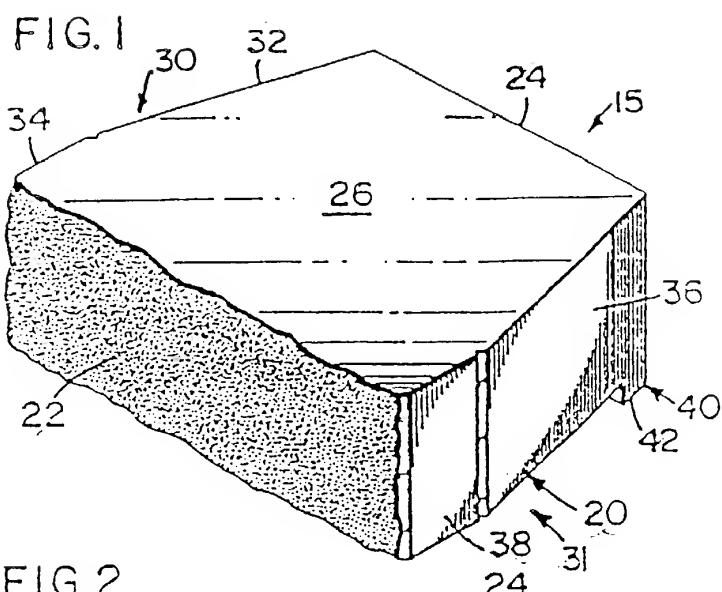


FIG. 4

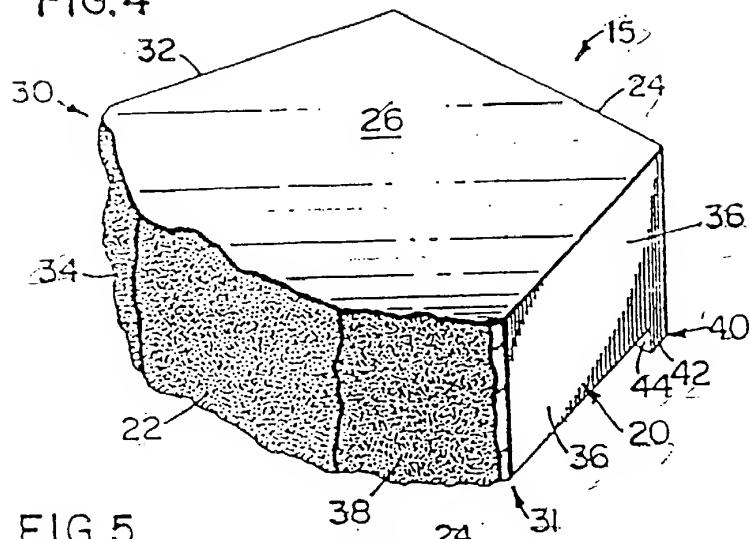


FIG. 5

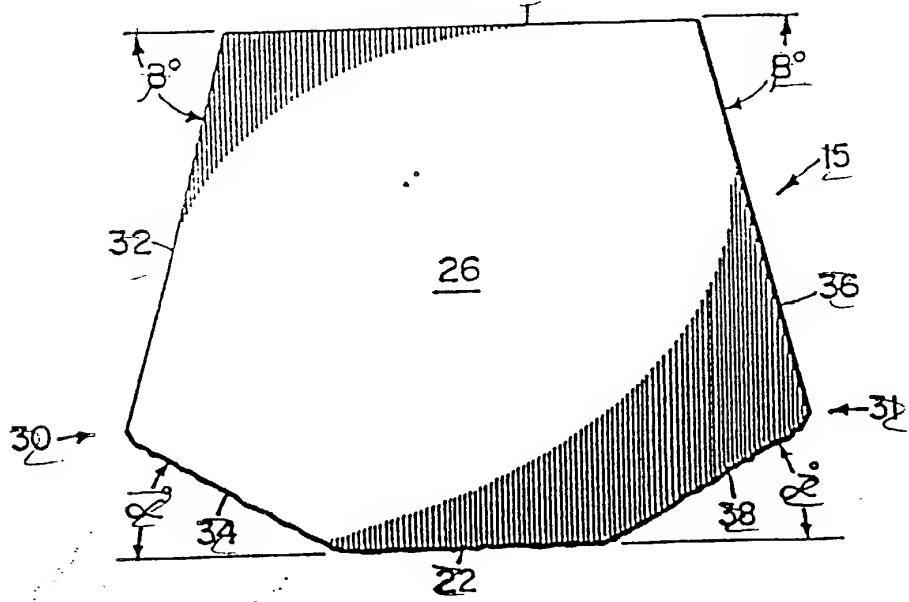


FIG. 6

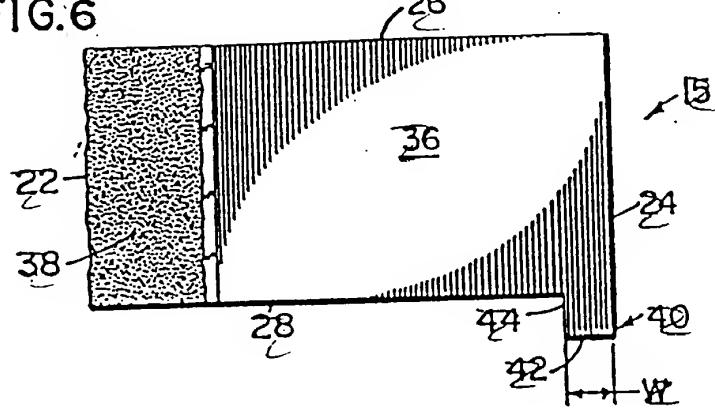


FIG. 7

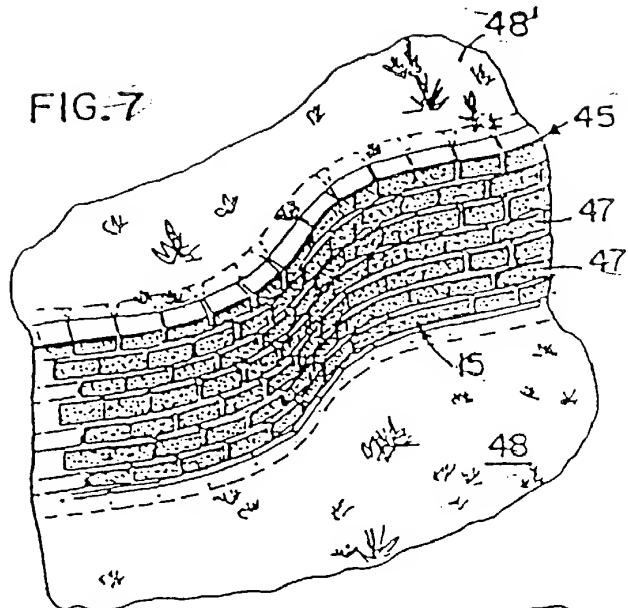


FIG. 8

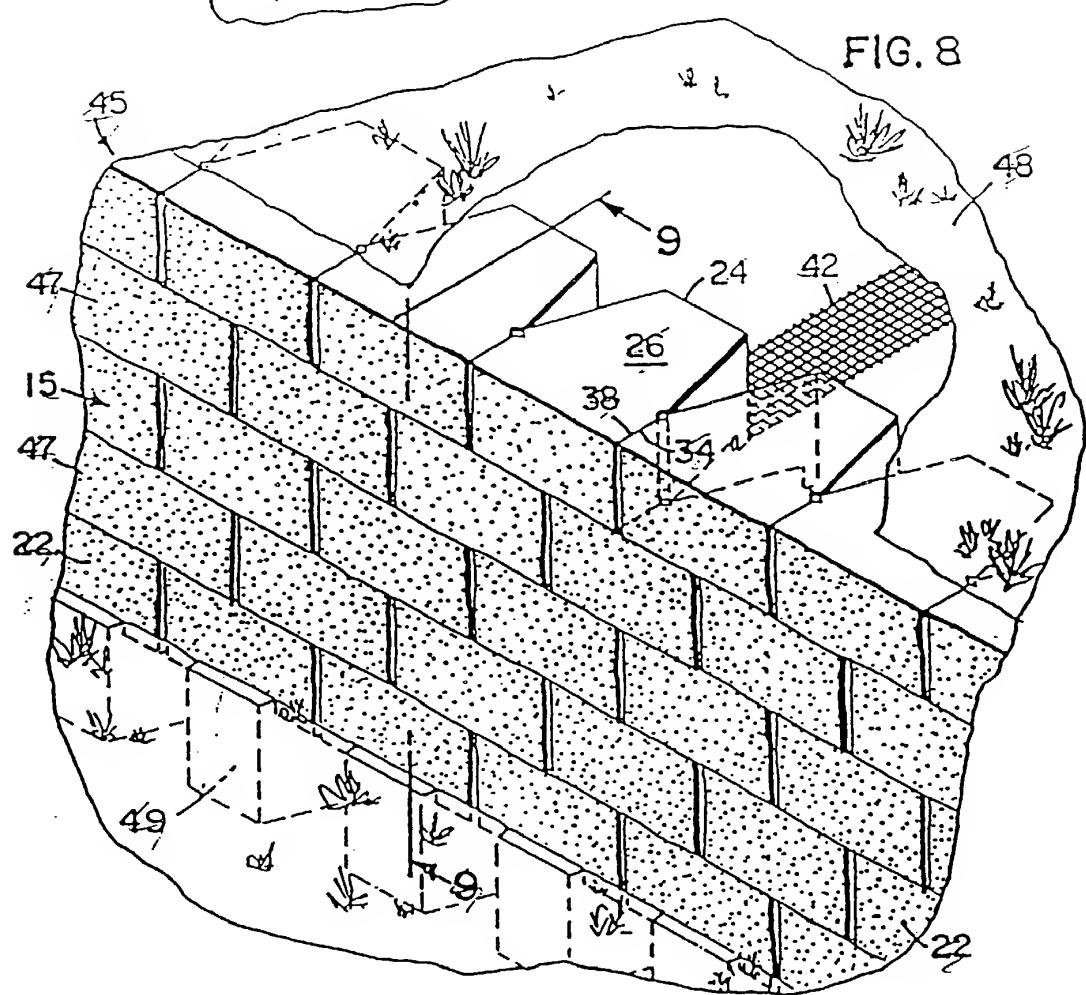


FIG. 9

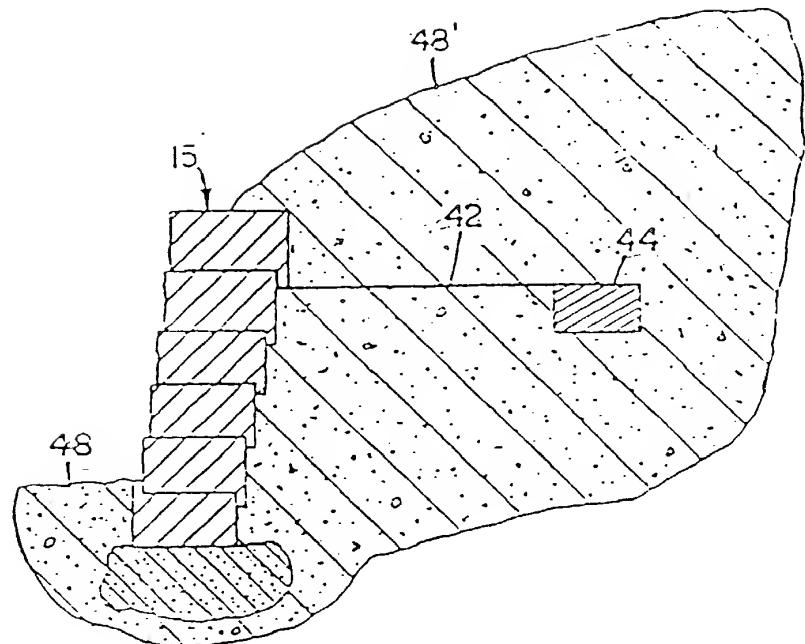


FIG. 10

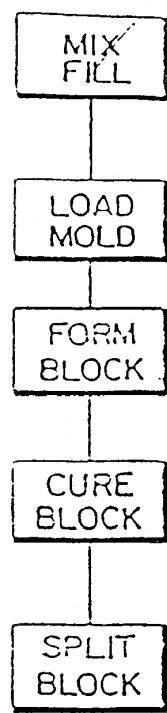


FIG. 11

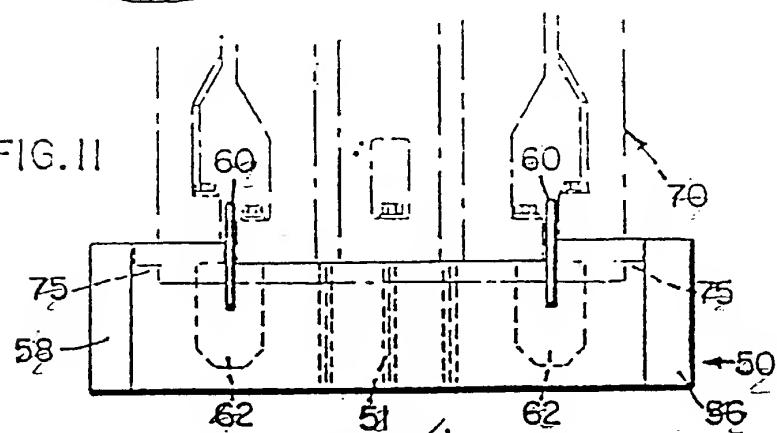
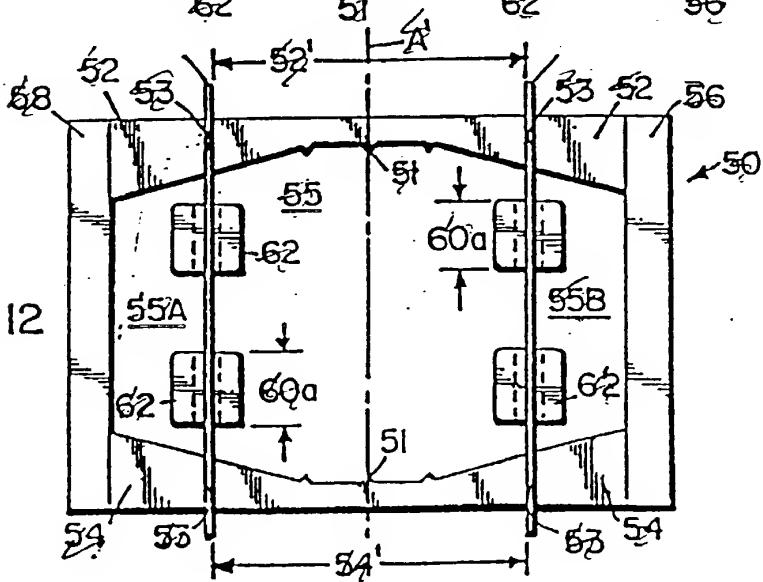


FIG. 12



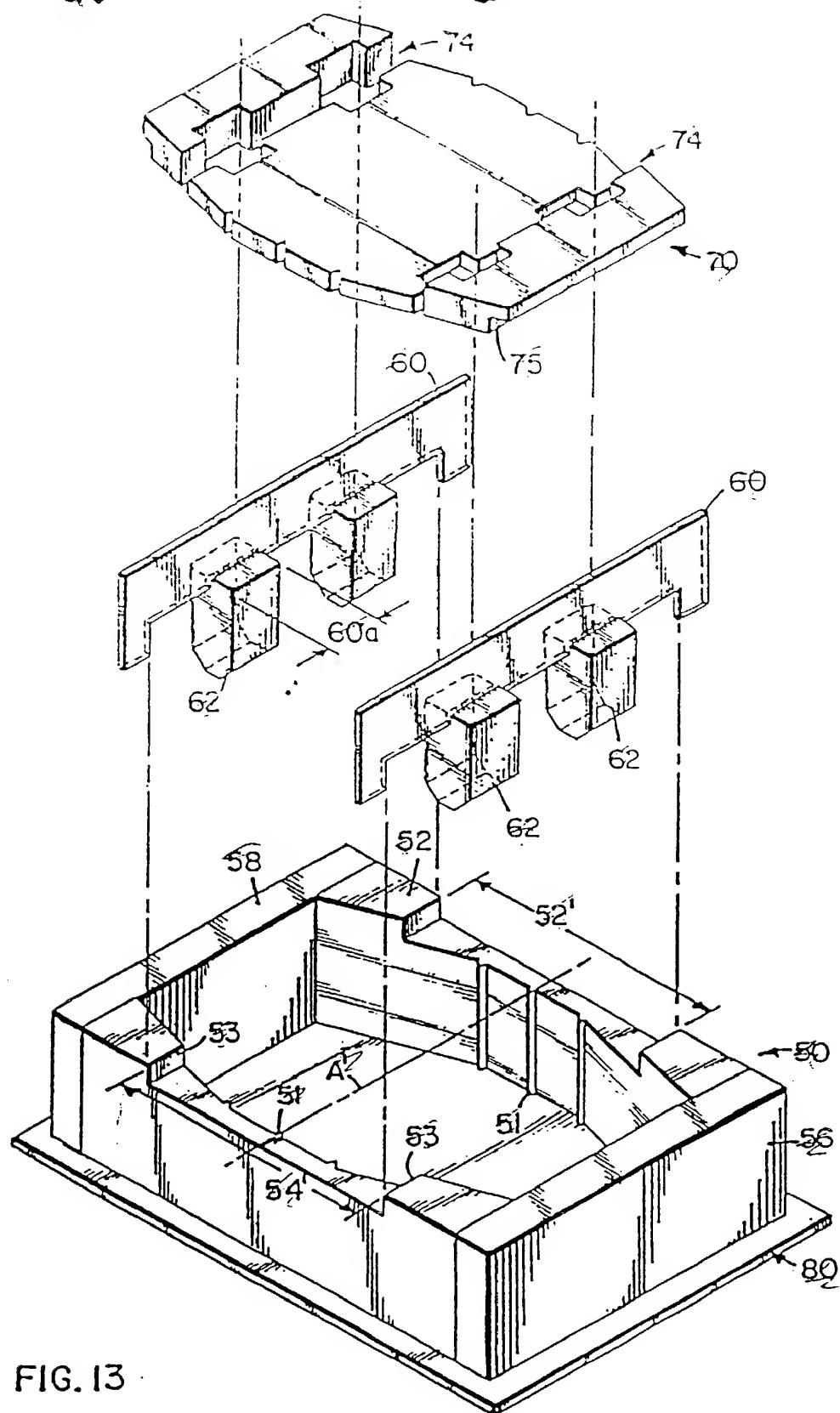


FIG. 13